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AGRICULTURE IN CENTRAL AMERICA

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INTRODUCTION.—From the deck of a steamer Central America presents an unfavorable impression as to possibilities for large agricultural enterprises because of the prevalency of rugged topography. Steep hill and mountain land come to the sea in many places, and occasionally lofty volcanic peaks are to be seen rising from the distant cordillera to heights in some instances of nearly 14,000 feet. Nor

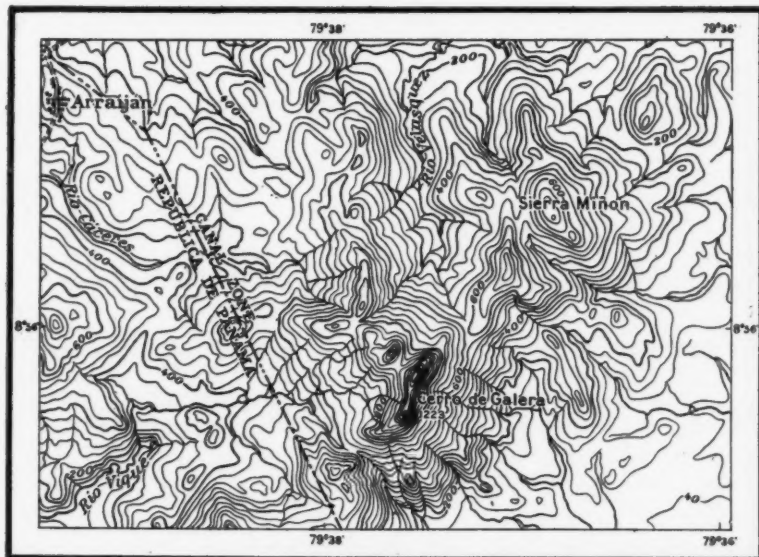


Fig. 1. Characteristic topography of hill country near the Pacific side of the Canal Zone. In areas of this kind there is considerable land smooth enough for easy cultivation. (Topography by C. of E., U. S. Army.)

is the impression removed by closer contact with the terrain, certainly not in many localities. There are numerous areas of smooth country

to be sure; flat coastal plains, river deltas, and broad stream bottoms; undulating savanas and high llanos; flattish and gently rolling plateaus and undulating to rolling high valley lands. Nevertheless, one is seldom beyond the sight of steep hills and precipitous mountain sides. In the Canal Zone, for example, where the maximum elevation is only 1,223 feet, and the average height of land less than half this, the country is exceedingly uneven of surface, and the traveller finds at the foot of every hill another hill to ascend, save for an occasional strip of stream bottom and the smoother savanas of the Pacific side.

SOILS OF CENTRAL AMERICA

THE MINIMUM OF SOIL EROSION.—If Central America should be placed in the humid southern part of the United States and its soils adjusted to that climate, its area of arable land would be reduced by erosion far below the present extent. To compensate in some measure for the excessive proportion of steep areas Nature has kindly bestowed upon the region large tracts of land, which, unlike the average sloping

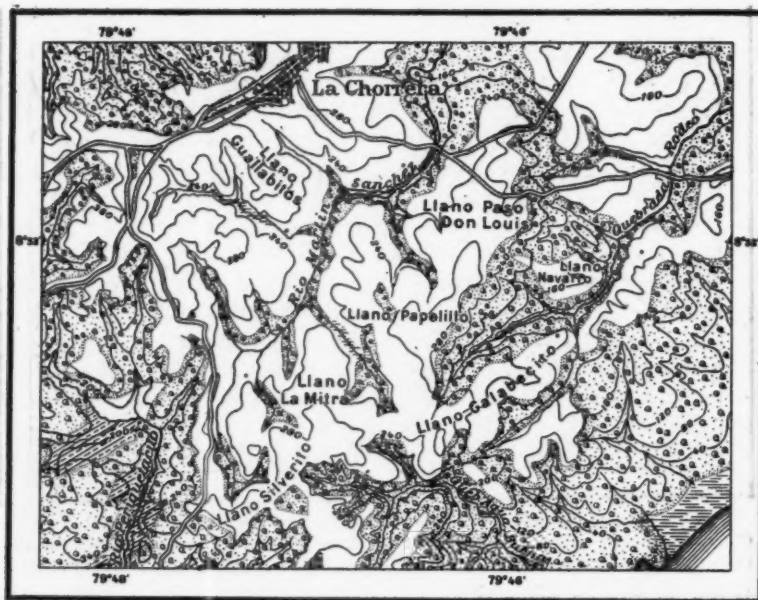


Fig. 2. Showing smooth, topography of the savana country, Pacific side of Panama. These grass lands, called Llanos have shallow clay soil, which dries to a very unfavorable hard condition. (Topography by C. of E., U. S. Army.)

soil of humid United States, is highly resistant to erosion. But for this beneficence, representing the effect of climate upon soil development, vast areas of Central American mountain sides would have been washed to bed rock long ago. In the United States it is not improbable that about ten million acres of land have been ruined by erosion, insofar as having important immediate value for crop production, and an area many times the extent of this has been seriously impaired. In Central America there are large stretches of mountain slope, much steeper than the average of the cultivated land in the most rolling sections of our country, which have been cropped since long before the coming of the *conquistadores*, where one will not see a single gully, except occasionally along some of the ancient roadways. Generally no evidence whatever of washing is to be observed on these peculiar soils; they are as resistant to erosion as the deep sandy lands of the Florida peninsula, even where the texture often exceeds in fineness the stiffest of North American clay. Such are the conditions prevailing over the central Costa Rican highlands, where extensive use is made of the land to elevations of more than 6,000 feet, in the production of corn, potatoes, beans, coffee, grass, and vegetables.

PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE SOILS.—On the pineapple farm of the United Fruit Company at Columbiana, Costa Rica, soil was found in which it was impossible to detect by ordinary field methods a single grain of sand, the total content of particles coarser than silt amounting to only .7 of one per cent, the bulk of the mass consisting of extremely fine particles of a colloidal nature. It was raining at the time this land was examined, in fact, it rains in this locality most of the time, the mean precipitation at Sarapiquí being 209.45, the maximum 263, and the minimum 180 inches; yet freshly cleared land was being plowed to a depth of 7 inches, and the soil was turning up in a decidedly crumbly condition. But little of it stuck to the shoes in walking across the newly turned furrows in the rain. Such conditions simply do not exist in the United States, where soils approximating this fineness of texture are so sticky when wet that they cannot be worked at all, and so hard when dry, except where the lime content is unusually high, as to be exceedingly intractable. We frequently designate our heavy clays under captions as "gumbo" and "cowhide" soils, because of their unfavorable stickiness or toughness at the extremes of moisture content. In Costa Rica and many other parts of Central America, and South America as well, the extremely fine textured soils possess perfect physical conditions for the absorption and retention of moisture, for the prevention of erosion and for easy working conditions. The climate has brought about

almost complete disintegration of the parent rocks to great depths, often to more than a hundred feet. Furthermore, the agencies of weathering have so altered the clay or colloidal material present that it has assumed the property of sticking to itself, by having developed, seemingly, a state of flocculation that prevents the filling up of the soil pore space, thus to maintain a most desirable mellowness and ready passage of rain water.¹ Under corresponding conditions in the temperate zone of the United States opposite physical properties are the rule.

Through these mellow soils rainwater percolates freely, the excess flowing off without taking up and carrying off the fine particles which refuse to mix with water except by extreme agitation and rubbing. This condition obtains to such a degree that the water of streams swollen by torrential rains often issues from the forested mountains almost clear, or with but a faint milky coloration.²

These are productive soils in many cases, giving without fertilization of any kind good crops of corn, bananas, plantains, beans, coffee, cacao, and a large number of tropical vegetables and fruits. Bananas have given good yields continuously for long periods on the lower areas without either fertilization or cultivation, and have shown little decline in yield where unaffected by the "Panama" banana disease.

Chemical analyses frequently show some of the soils of the region to be even more fertile than the average of many of the most productive soils of the United States, particularly as regards content of organic matter, nitrogen, and phosphorus. The more friable soils frequently show a deficiency of potash and lime, and the silica has decreased; but there is often more iron and alumina than is contained in the parent rocks. Some well drained tropical types of soil have shown as good content of organic matter in the subsoil as in the surface,³ a condition never encountered in temperate zones except in the peculiar *podsol* types of timbered northern latitudes and the "hard pan" types of the Flatwoods of southeastern United States.

In some localities there are extensive areas of soil possessing desirable friability because of its origin from coarse unconsolidated volcanic ash material. Such friable soil is abundant in the republic of Sal-

¹ In Cuba the writer has found large areas of mountain soils where with a rainfall of approximately 50 inches there is no observable effect of erosion whatever. In this soil pick marks have been noted in vertical exposures which have shown no sign of obliteration after exposure of more than a year.

² The chemical and physical properties of these friable soils are discussed in detail in a paper by the writer, published elsewhere: *Soil Science*, XXI, No. 5 (1926).

³ Report, American Soil Survey Association, Fifth Annual Meeting, Chicago, 1924, Bul. VI (Ames, Iowa).

vador, a rolling hilly country, which in 1922 exported coffee, sugar, rice, henequin, indigo, and other products to the value of sixteen million dollars. Also there is at least one large area of soil which is friable because of its high content of quartz sand, that of the great lowland savana extending from the southern end of Pearl Lagoon in eastern Nicaragua, northward to the Segovia River on the Honduras boundary.

GEOGRAPHIC IMPORTANCE OF SOIL STUDIES.—These favorable characteristics vitally affect the agricultural possibilities of Central America, probably more so than any other geographic feature, save that of climate and topography. Of course, there are very large areas which are topographically unfit for any kind of crop production, including slopes so steep that the soil would fall away by simple force of gravity if disturbed. And there are also unfavorable soils even where the topography is favorable, such as wet sandy savana and stiff clay savana, the latter becoming so hard and desiccated in the dry season that grass is parched within a few weeks. Nevertheless, the peculiar favorable soil conditions over extensive tracts of uneven country very greatly enlarge the producing area.

The statement will be risked that one will not find in the geographic literature on Central America very much that relates to these vital soil facts, which are truly of a geographic nature in that they are so pertinently related to the welfare of the inhabitants of the region. Much will be found about soil exhaustion, and much of that will not be true. By this it is not meant that the productivity of the land has not depreciated temporarily, but that there has not been any great amount of permanent soil exhaustion. All the land is not proof against erosion; on the slopes of the less friable and stable types there has been soil exhaustion in the sense that the productive surface layer has been washed off. Temporary impoverishment of the land is to be seen in some of the patches of those farmers who chop down and burn the forest cover, cultivate the ground a few years, and then abandon it for new and more productive clearings; but in a very large number of cases the reduced yields met with under this *milpa* plan of farming are due to encroachment of grass and weeds, coupled with disinclination of the farmer to remove them from his untilled fields, rather than to soil depletion. In some cases declining yields appear to be due to soil impairment, such as may be the result of inadequate soil aeration and incorporation of humus in the absence of cultivation. At any rate, after a few years in *restrojo* (secondary growth) the land is recleared and recropped with results that satisfy the native patch farmer.

The theory has been advanced that the Maya race abandoned the lowlands of eastern and northern Guatemala because of soil depletion.



Fig. 3. Hillside farm of small planter in the Republic of Panama. Second growth jungle, formerly used for crops, in background.

If this ancient race, who built strong temples of stone and erected beautifully carved monoliths, failed to cultivate their crops, as do the present day patch farmers of the region, there may have been tempo-

rary soil impoverishment, even though the same lands today produce splendid crops of bananas, corn, peas, and vegetables, and support magnificent forests. It is interesting to observe in this connection the excellent crops of corn obtained among the ancient Maya mounds so numerous on the intermountain plateau about the city of Guatemala. Here the corn is cultivated to some extent, and the yields are often good, frequently amounting to more than 50 bushels an acre, according to local estimate. This crop has been grown on these lands for a very long time, with little or no fertilization. The American Consul General at Guatemala City observed that "corn has been grown here back to a time when the memory of man runneth not to the contrary."

We shall seek no argument with the geographers and scientific agriculturists for having left out of their observations the soil factors pointed out, nor with those practical farmers who spent large sums of money in clearing and planting bananas, laying rail lines and building farm houses on the *talpatate* soils of eastern Guatemala, where failure was preordained by the extreme poverty of the soil. We have had and still have here in the United States too much ignoring of the influence of soil in agriculture to become amazed at conditions beyond Mexico. It is comforting to note, however, that this problem is showing rapid improvement—that most of our experiment stations have ceased to make statewide recommendations to farmers upon the basis of tests made upon a single type of soil, which may be utterly different in its character, adaptation, and requirements from other important agricultural soils of a state.

No harm will come for noting here the complaint that too many writers in describing foreign countries content themselves with observations as to topography, climate, means of communication, imports, exports, education, character of population, government, politics, and almost all manner of things except the soil. When the great American fruit and sugar companies enter the tropics they first look for enough favorable soil for sustained large-scale production. Even with these precautions high losses sometimes have occurred because of errors in soil appraisal, such as failure to look into the subsoil for possible toxic salts, impervious claypan, and so on. The average writer of economic conditions in the tropics misses both the soil and subsoil, usually condescending to say not one pertinent word about soil conditions. If the region described is an agricultural one or aspires to become an agricultural region, as is almost sure to be the case in the humid tropics, then the treatise for that region which leaves out of account tangible soil facts falls very decidedly short of a true appraisal of economic possibilities.

When one is frightened over the imagined prospect of an impending inadequate food supply, some cheer may be derived from contemplating such things as the durability of the friable soils of the humid tropics, and the estimate of students of ancient races to the effect that millions of humans once thrived in the province of Copan, which is but a state in the small republic of Guatemala.

TYPES OF FARMING

The principal types of agriculture in Central America are: (1) specialized farming, as represented mainly by the production of bananas, coffee and sugar, for home consumption and export; (2) general farming, including the production of corn, beans, rice, tropical fruits and vegetables, chiefly for local consumption; (3) live-stock farming; and (4) patch farming.

BANANA CULTURE.—The growing of bananas for export is confined chiefly to the bottoms and deltas of streams entering the Atlantic. The crop gives much better returns in the humid lowland regions,—the *tierra caliente*. With irrigation, however, it is successfully grown on the alluvial soils of the drier localities as in the Santa Marta district of Colombia. In recent years the Panama disease has devastated so many



Fig. 4. Dry grass land (dry season) in contact with forest-covered alluvium in the red Savana region of Pacific Panama.

of the older farms that quite extensive plantings have been made on the less productive upland slopes and hill lands, such as those in the vicinity of Turrialba, Costa Rica, and along the shores of Gatun Lake

in Panama. Also, plantings are now being made and planned for on the Pacific side, to which the large companies formerly were opposed on account of the longer haul to the more important consuming markets of Eastern United States and England. Some bananas and plantains are grown at altitudes of 3,000 or more feet for home use, the bunches produced here being rather small.

The best fruit is produced on well-drained alluvial soil ranging in texture from loamy fine sand to silt loam. Where there is enough clay to impede underdrainage of stream bottom soils sufficiently to produce mottled coloring of bluish-gray and rusty-brown the plants seldom attain marketable size. On soggy blue clay all the banana plants seen were of very stunted growth, and but few bore fruit. Before the invasion of the Panama disease upland bananas were generally avoided by the Central American exporters, because of their frequent small size. With the growing scarcity of good alluvial banana soil in this region, the exporting companies are buying stems of smaller size than formerly, even those having only 5 or 6 hands.

No effective remedy has yet been discovered for reducing the damage done by the Panama disease, once a field is badly infected. Some growers claim good results from the use of burnt lime in advance of the appearance of the disease, and some have made use of this treatment on a fairly large scale. It appears that while the disease occurs on soils of neutral to alkaline reaction, it is less likely to spread here than on acid soils.

It was observed in the spring of 1924 that bananas were doing well along the Motagua River in Guatemala in the same fields where the plants were thriving in 1919, although the disease had been scatteringly present in this locality before the latter date. Here the soils are prevailing of excellent drainage and of alkaline reaction, the alluvial material having been partly washed out of the alkaline Zacapa Desert. In many other localities extensive plantings were seen which had been so devastated within periods of 4 or 5 years after planting, or within shorter time, that abandonment was necessary. Some failures were observed on neutral and alkaline soils, indicating that this condition does not afford absolute protection.

The "Panama" disease is caused by a fusarium which attacks the tree internally. It functions much on the order of tomato wilt, cotton wilt, or watermelon wilt. Abandonment of the land or change to other crops seems to be the only alternative once a field becomes badly infected, i.e., in the light of present knowledge. Some varieties are more resistant to the disease than others. The red banana is more resistant than the common Gros Michael, and others are said to be

still more resistant, but they have not thus far proved so readily marketable.

No cultivation whatever is given the banana in Central America. In planting new ground the undergrowth is removed and sections of the rootstock, called "bits" are planted in line, usually about 20 feet apart in both directions. Following this, the large forest trees are felled and left as they lie. The young shoots spring up through this tangled mass of trees and vines. Within 14 months these have grown to "trees" 15 or 20 feet tall, with a bunch of fruit ready to cut. By this time the small trees and all the branches of the original forest have decayed, and the field is sufficiently open for harvesting. Bushes, weeds, and the excess of young banana shoots are kept down by two or three annual slashings with the machete, the universal implement of tropical lowland agriculture.

When the fruit has reached the desired size the tree is cut down, and the bunch descending upon the shoulder of a second man, the "backer," is severed from the parent plant. The backer carries this stem to a convenient place to be loaded on a tram car or mule for transportation to the main line railroad, where, on the same day, it is collected by the "pick-up" train and carried to the steamer.

Enough young plants, which are springing up all the time, are left to maintain a full stand of trees of all ages and sizes, so that a properly cared-for banana field never stops producing, except when growth is severely checked by dry weather, or disease or when wind storms blow down the plants.

In 1924 the effect of drought was so severe on some of the plantations of Honduras that much damage was reported to have been done by fires started among the parched leaves. Almost every year wind storms take heavy toll of many Central American banana plantings.

A common conception prevails among those who have not visited banana plantations that the best fruit ripens on the tree. Ripe bananas are almost never seen on the tree. Within certain limits the greener the fruit at the time of cutting, the better the quality of the subsequently ripened product. Those bunches which are cut at an earlier stage of development for the longer shipment to Europe ripen into better eating fruit than the more nearly "full" fingers cut for the shorter trip to the United States. The expert banana cutter selects bunches for shipment according to the stage of "fullness" of the fruit to fit the destination or time required in transit.

The plantain is a cooking banana. In tropical America it is truly the staff of life for a vast number of people. Sliced and cooked green it is used in large quantities in the place of bread; indeed the natives

of the lowlands often have little else to eat at many meals. It is much more palatable to the North American if cooked after partial ripening.

The area devoted to bananas grown for export in Central America is estimated about as follows:

	Acres	stem, exported
Guatemala (1922).....	33,000	14,727,865
Honduras (1922).....	106,000	15,213,189
Nicaragua (1923).....	24,000	3,420,326
Panama (1923).....	25,000	4,000,000
Costa Rica (1922).....	42,000	7,671,619
Total.....	230,000	45,032,999

This does not represent the total acreage of land which has been used in the production of this fruit. It is estimated that more than 20,000 acres formerly in bananas in these countries have been planted to cacao as a result of disease, and that four or five times as much has been allowed to grow up, or is used for pasture with small areas planted to balsa trees, pineapples and citrus fruits.

Probably more than 75 per cent of the present acreage belongs to the larger American banana companies, which not only produce but ship and distribute their products. The number of independent growers is increasing. These sell most of their output to the big companies.

The industry has been so profitable recently and there has come about such a scarcity of first-rate banana land in these countries, that there has been what amounts to a stampede for plantable land. Individuals have cleared and planted small and fairly large tracts, some of which are in rather isolated localities. They usually manage, however, to get their product out with mules or boats to rail lines for sale to the large companies.

CACAO.—Cacao is another product of the humid tropical lowlands, and like the banana it prefers well-drained friable soil, making slow growth on stiff clay land. At present the production is not on a very large scale, but with the extensive plantings on abandoned banana land, particularly on the coastal plains, deltas, and bottoms of eastern Costa Rica and the Bocas del Toro region of Panama, coming into production, this crop will soon hold an important place in the agriculture of the region. In 1922 17,500 acres of cacao were reported for Costa Rica, with exports of more than seven million pounds of beans. Here the acreage and production are steadily mounting. Nicaragua exports about 330,000 pounds, annually, and Guatemala shipped 451,000 pounds in 1922.⁴

⁴ Data from Supplements to Commerce Reports, Bureau Foreign and Domestic Commerce, U. S. Dept. of Commerce.

Cacao trees are usually planted so closely that the boughs form a complete canopy, which shades the ground most effectively. Shade trees have been left from the original growth or planted in many of the groves. They probably are not necessary to healthful growth, since many of the finest groves seen in Ecuador, where cacao is the principal export product, had no shade trees. No cultivation of the ground is practised, but weeds and bushes are kept down with the machete. The undergrowth is eventually reduced to almost nothing by the shade of the growing trees. Some of the larger growers of Ecuador claim that the reduced expense of weed control by shading justifies close planting, particularly with the recent low prices and narrow margin of profit.

For the small grower cacao has some advantages over bananas, especially in the matter of transportation and preservation. No elaborate or expensive equipment is necessary; the cured beans are not very perishable and not bulky in comparison with their value. They can be grown in outlying districts and transported to a shipping point at a convenient time, whereas bananas must be conveyed at once to the shipping point and they must be handled with care in transit, since bunches with as many as three or four injured fruits are rejected by the shippers.

As yet no very troublesome disease, such as the monilia and witch's broom of Ecuador, has appeared in Central America, and this amounts to a very important advantage.

COFFEE.—Coffee is the most important export crop of the Central American highlands—the *terra templada* region. Some small patches are seen occasionally in the low country, but it is of no commercial importance under elevations of about 2,000 feet. It is grown up to about 5,000 feet, the best results being attained usually between approximate elevations of 3,000 and 4,500 feet. The quality is said to vary with the elevation and the yield with the soil. In Guatemala it is claimed that the best flavored product comes from groves at 3,200 feet and that the product from 4,500 feet is too acid for a drinkable cup, unless blended with lowland coffee. In Costa Rica the bean of most favored quality comes from elevations of around 4,000 feet. A trip to San Jose, Costa Rica, is worth while if for no other purpose than to drink some of the delicious coffee served in that country by those who know the art of brewing it.

Coffee is transplanted from beds to field rows, usually close enough for the branches to meet or intertwine at full growth. Cultivation consists of spading the soil around the base of the tree, then back to the centers of the rows. This effectively controls the weeds, and probably aids in conserving moisture. In the drier localities small pits

1 to 2 feet deep are placed at intervals of about 20 feet through the groves to aid in storing rainwater in the soil.

Nearly all of the fields are shaded with interplanted trees, such as *quajiniquil*, *modern negro* and others usually of the leguminous family. Bananas and plantains are also used, and at lower elevations fields are sometimes shaded with the *Castilla* rubber tree. Some claim that shading serves no useful purpose—that it is nothing more than a traditional habit with the coffee growers of Central America, citing the fact that shading is not practical in Brazil. In answer to this the Central American grower usually mentions the better prices received in the past for his product and continues to set shade trees in his new plantings.

The best coffee lands are the deep friable well-drained soils derived from volcanic ash. The residual soils from basic rocks, such as some of those near Turrialba, Costa Rica, in which weathering has caused a marked reduction of the bases and silica and an increase of alumina and iron, have not proved so durable in the production of coffee as the dark-colored ash lands, which usually are high in organic matter and contain fair to good amounts of lime, potash and phosphorus. Some of the best growers claim profitable increases of yield from the use of burnt lime and phosphatic fertilizers.

Coffee plantations in those regions where there is a well-defined wet and dry season have at least one advantage over the groves of the more humid localities, where rains fall throughout the year, in that under wet-and-dry conditions harvesting is restricted to a comparatively short season with an abundance of ripe berries, whereas a few berries at a time must be picked throughout the year or through a much longer season where the rains are more generally distributed, thus increasing the expense.

Maximum crops depend upon the regularity of the rains. Unseasonable heavy rains during flowering time, following the close of the regular rainy season, sometimes damage the blossoms before young fruit is set, and also cause rotting among the growing berries from earlier blossoms. On the other hand, an unduly prolonged dry season will sometimes prevent full maturity of the new fruit crop. Unseasonable rains also introduce difficulties with the open-air process of drying the berries.

It is not possible to give the exact production of coffee for Central America, owing to inadequate means of collecting statistical data relating to crops. The total production for 1922 probably was about 300,000,000 pounds, Guatemala and Salvador being the largest producers, the crops of these countries amounting to 100,000,000 and 105,000,000 pounds, respectively. Panama is the smallest producer,

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of the Central American States, with about 1,000,000 pounds, or less than enough for home consumption.

The bulk of the Central American coffee crop is exported. It is said to be usually impossible to buy the best grades of coffee on the local retail markets, as all of this goes abroad.

ACREAGE, YIELD, AND VALUE OF COFFEE EXPORTS, 1922
CROP OF CENTRAL AMERICA

	Acres	Pounds	Value of exports
Guatemala.....	242,062	105,072,300	\$ 9,353,664
Salvador.....	185,250	100,000,000	14,216,005
Honduras.....		694,209	94,839
Nicaragua.....	75,000	(exported) 30,000,000	2,300,572
Costa Rica.....		40,956,967	6,677,762
Panama.....		(exported) 1,000,000	—

Most of the high grade coffee went to Europe before the World War. Restricted shipping facilities directed the greater part of this to the United States during the war, but since that time Europe again has entered strongly into the market.

Of the Costa Rican crop for 1913 the United States took less than 6 per cent, while the United Kingdom alone took 82 per cent. In 1923 the United States took 34 per cent of the crop as against 59 per cent for the United Kingdom. Coffee sold for 12 to 20 cents a pound or higher, alongside the railroad in 1922, averaging over 16 cents, according to the U. S. Department of Commerce.⁵

For a long time there has been a saying among coffee people that the United States does not care for coffee of superior quality, and has been a poor buyer of the extra fine Central American product. This situation is changing somewhat, and we are now buying much good coffee from Guatemala and other Central American republics.

SUGAR.—In Central America sugar cane is as much of a west coast product as bananas are an east coast product, at the present time—at least for most of the region. The west coast being drier, a higher content of sugar is obtained, than in the regions of heavy precipitation on the Atlantic side. There are, however, a number of sugar plantations and factories on the Atlantic side, as for example, those in the vicinity of Turrialba, Costa Rica, and Ceiba, Honduras.

A very high grade cane is grown in the drier regions. On the dark-colored soils of western Guatemala, in the broad coastal plain

⁵ Supplement to Commerce Reports, No. 27: Costa Rica, p. 10.

strip that swings down from southwestern Mexico and crosses Guatemala into northern Salvador, the sucrose content of sugar cane is said to range from 13 to 15 per cent. At the factory of the Pantaleon Plantation, the 1924 crop was reported as running from 12 to 18 per cent of sucrose. The yield on this plantation ranges from 30 to 60 tons of cane per acre. This belt becomes so dry in February or March that crops frequently are retarded in growth seriously where irrigation is not practiced.

In the climate of these countries, replanting is necessary only at long intervals, the crop reestablishing itself from the stubble as ratoon canes. Fertilizers are not in general use, although manure and lime were reported as giving good results on the cane of the Pacific Coastal Plain in Guatemala. In Costa Rica, west of the capital, one large sugar grower was interplanting cane with peas, with very good effect. Here the yields were reported as diminishing to the point of unprofitableness within a period of five or six years, where the peas were not used. This was on a thin type of soil, underlain by a sponge-like rock called *cascajo*.

In harvesting the crop the leaves are stripped and left on the ground, and the entire mass is often burned, sometimes accidentally, in the dry season. Damage is done if the burning comes after the ratoons have sprouted, and soil moisture and organic matter are lost under this practice. The crop is usually cultivated, especially on the larger plantations of the Pacific Coast. Probably it would be best to remove the mat of cane leaves from one row center to another in order to plow the cleared center, rather than to remove the *paja* by burning.

There is much unused good soil for sugar cane production in Central America in such localities, for instance, as the coastal plain of western Guatemala. Here the output could be largely increased by the establishment of irrigation projects.

Guatemala produced in 1922, according to the best estimates available, 162,437,100 pounds of sugar; Salvador, 40,000,000; Costa Rica about 19,000,000; Nicaragua, 49,512,000; Honduras and Panama, 60,557,000.

RUBBER.—The story of the rubber plantations is a distressing one. Some twenty years ago the collection of forest rubber was an important industry in several parts of Central America, as in the valley of the San Juan River in Costa Rica. Under the stimulus of high prices rubber trees were planted on a large number of plantations on both the Pacific and Atlantic side. Foreign companies were organized and expensive plantings carried on. Also local capital was liberally spent. The promised fortunes thus far have not materialized. Rubber values began to

depreciate before the planted trees were large enough to tap, and the downward trend continued almost steadily. In recent years even the native rubber gatherers (*caucheros*) have practically abandoned their profession of collecting rubber from the wild trees. None of the plantations have returned dividends, and not a single one of the many visited was operated at the time, except for occasional small collections of latex used in the home manufacture of rain coats and ponchos. Nearly all of them were in state of abandonment, and most of them had reverted to jungle. Recent sharp advances in the crude rubber market have stimulated some activity in these long neglected plantings.

A number of mistakes were made in connection with this widespread stampede of rubber planting, the greatest of which probably was the general selection of the *Castilla* rubber tree. This tree cannot be tapped more than once or twice a year, according to the methods used, and it frequently dies or is irreparably injured at this rate of working. The yield is low and the value of the product is only about 80 per cent of the value of Para rubber—that obtained from the *Hevea brasiliensis* or Amazon Valley rubber tree. It was the latter tree that brought success to the great rubber plantations of the East Indies. If this had been selected for the plantations in Central America and southern Mexico, the story of plantation rubber in these regions might have been a different one. That it will grow well here on deep, well-drained soil of friable tilth has been proved by a number of small plantings.

Had the native *balata* tree been planted, success might have been achieved as the product of this tree was bringing even a better price than Para rubber, prior to the recent upturn on the crude market.

GENERAL FARM CROPS.—Corn is the most important of the general farm crops, if not of all crops grown. There is little or none for export, but it is grown everywhere, and is probably the most important food of man. It is produced on all varieties of soils and under almost all conditions of culture, from that of the careless patch farmer to the farmer who prepares the ground and cultivates the growing plants. The *milpa* farmer simply fells the vegetation over a small area, sets fire to the tangle, and plants the seed among the partly burned poles and logs in a hole made with a sharpened stick. If he feels so disposed he occasionally slashes the weeds, but frequently he is not inclined to do this much. Some corn is usually made, however, even where the field is completely neglected. The better farmers often make 40 or 50 bushels per acre, frequently producing two crops a year in the same field. It is not uncommon to see young corn coming on between rows of mature corn.

A variety of beans are grown throughout this region, including several of the cowpea group, large black and red *frijoles* and others. Some lentils are produced in the drier localities. The production of beans in Guatemala for 1922 is reported as amounting to about fifteen million pounds and that of Salvador ten million. The other countries also produce large quantities, and small exports are made to neighboring states by some of the republics.

Beans constitute a very important article of diet, throughout Latin America.

Rice is another important crop, grown chiefly for home consumption. It is commonly grown without irrigation. Salvador in 1922 exported 2,698,799 pounds; while Panama imported 363,392 pounds.

Other crops of importance are cocoanuts, pineapples, henequin, potatoes, tobacco, and yucca. Small quantities of cotton, citrus fruit, indigo, oats, wheat, and a large number of tropical vegetables and fruit are grown, and some of these occasionally are listed among the exports.

LIVESTOCK.—The cattle industry is of much importance in the Central American States, and a considerable number of hogs are raised in some localities.

Some of the countries produce a surplus for export; others produce little or no excess beyond the requirements for local consumption.

There were in Costa Rica in 1922 476,774 head of cattle. Of those 82 per cent were pure natives, 3.5 foreign, and 14.5 per cent crossed breeds. The exports for that year amounted to 49,695 head. There were also 113,590 hogs, of which less than 2 per cent (1.7 per cent) were of foreign breed and 9.6 per cent crossed breeds. The exports of hogs that year were 32,477.^a

In the other countries the cattle are also largely of native stock. These are generally quite fine looking animals of large size. Many of the larger cattle growers control the tick by dipping. Foreign cattle seem to get along satisfactorily in these countries.

Feed is usually abundant the year round in the more humid localities, especially where plantings are made of a number of introduced grasses, such as "Para" and "Paraguay." These grasses are easily started in the pastures, and they produce an abundance of feed. There are also a number of native grasses which afford good grazing. *Gamilote*, a large *Paspalum* growing most luxuriously in wet places, is relished by stock generally, and there are a number of other good *Paspalums*. In the drier sections grazing is usually abundant in the wet season; but is often scarce in the latter part of the dry season.

^aSupplement to Commerce Reports, U. S. Department of Commerce, No. 27: Costa Rica.

"Guinea" grass, another introduction, is easily established in the pastures, and furnishes good grazing through the dry season, even on dry, shallow soil.

Foresight must be used in providing sufficient pasturage in the drier sections to carry the cattle into the rainy season, since there is little growth, without irrigation, during the driest months, and on certain soils such as the savanas of western Panama, the grass becomes so completely parched that fires are of frequent occurrence. The stalks of banana plants are sometimes used as supplementary feed.

In some of the countries a considerable number of sheep and some goats are raised; in others but few of these animals are seen. Of sheep, 184,635 were reported in Guatemala in 1922, and of goats 16,581. In Costa Rica the number of both sheep and goats reported for the same year was only 1,912.

The milk, butter and cheese produced is generally insufficient for local needs.

There are opportunities for a large expansion of the cattle industry in all of the countries, save perhaps, Salvador. One of the greatest drawbacks to further important development of animal husbandry is the inadequacy of highways and railways. Cattle and hogs are often driven long distances to market over trails which in the rainy season are barely passable. Fine hogs were seen in the San Carlos River section of northern Costa Rica, which had been fed chiefly on bananas; but the owners claimed generally that the difficulty of getting them out to market was enough to discourage any large-scale production. Some claimed that at these long distances from market it was usually best to carry out only the lard.

Mules, horses, and burros are used extensively for riding and packing; but the principal draft animal is the ox.

AGRICULTURAL LABOR IN CENTRAL AMERICA.—At the present time there is not much more than enough labor to carry on existing agricultural operations in many localities. In Salvador, where the density of population is very high, there is a sufficiency of labor, even more than is actually needed; but this is not the situation generally by any means in the other countries. With a more general use of plows and labor-saving farm implements, the present supply of labor could be made more productive. The native, however, does not take readily to new methods or new implements. Some surplus labor is to be found in the cities as a rule, but much of this is of uncertain character and inclined to flow back to towns at the first opportunity.

The farm work in the highlands is performed by natives, chiefly of Spanish-Indian blood. These are good workers, somewhat tempera-

mental, perhaps, but usually efficient so long as their landlord or boss sees to it that they have a house or shack to live in and sufficient simple food and clothes.

These people as a rule have little interest in the political agitations that sometimes lead to revolutionary outbreaks. Left alone by the habitual disturbers, they are a peaceful, polite, hard-working class, who appear to like their home places and the activities of farm life. Walking out from Cartage, a Costa Rican city, on an important feast day celebration, recently, it was quite a surprise to find that so few of the farm people had gone to town. Men were busy in the field and along the roadsides, threshing beans and spinning henequin fiber into twine, while the women were engaged in the moulding of earthenware and other tasks about their homes. With such a celebration going on so close by, most of the farmers of the average community in the United States would have put aside their farm duties and motored to the celebration.

The complaint is frequently heard in Latin America that there are too many feast days and too much knocking off from work to join in the celebration of these. No doubt much time is devoted to these occasions, but in some localities at least, it is the villager and city man rather than the farmer who makes the most punctual celebrant.

West Indian blacks perform much of the labor on the banana plantations. They seem better adapted to the hot country than workers of Spanish extraction. In clearing land the native is said to be the most efficient worker, while the black excels as a field hand on the banana farms.

CONCLUSION

At the present time agriculture in Central America is largely concentrated along the rail lines and highways and near the cities. Leaving these, the proportion of used land becomes less and less until finally untouched jungle is encountered. Large areas of good land remain in the virgin state, especially in Nicaragua, Costa Rica, Honduras, and northern and western Guatemala. The province of Copan, once the home of millions of the ancient Maya, is an extremely thinly settled region of heavy forest, good soil, and favorable topography. The same is true of the great San Juan Plain in northeastern Costa Rica, where huge bunches of the finest bananas are fed to hogs because of lack of transportation. Large agricultural possibilities await development in these regions of magnificent tropical forests. Bananas, sugar cane, cacao, tobacco, beans, rice, cattle, and hogs stand out as promising farm products. Under irrigation, banana production can be increased enormously on the west coast, and there is still available much good banana

soil in regions at present unused because there are neither railways nor highways. It is true there are some inferior soils, but very little of this except in the rougher mountainous areas, is so poor but that it will afford fair to excellent grazing. Grass grows abundantly even on the unfavorable clay soils of the low hilly country back of Bluefields, Nicaragua. The ease with which corn and the starchy root crops are grown, such as cassava (yucca) and yams insures large possibilities in the raising of hogs.

But there are many obstacles to be overcome in developing these unused lands. First of all is the almost complete absence of roads away from the centers of population. Even trails are lacking in many localities, and most of the existing ones are rough in the dry season and terrible in the rainy season. In opening new lands, particularly in the *tierra caliente*, provision must be made for screening the malarial mosquitoes from dwellings. There seems to be no certainty as yet that extreme political agitation may not at any time jeopardize property and create dissatisfaction or panic among laborers. Revolutions have become very distasteful to business men generally in these countries, and to those who have the best interests of their country at heart; but the advice of these does not always prevail. One very successful planter was heard to say: "We have too many politicians, too many whose ambition it is to get a government place, and who will go to any extreme to obtain political favor."

An American entering these republics to farm will, in most instances, be handicapped with an unfamiliar language; he will not for a time know how best to handle the labor. An Iowan, acquainted with farm life in America, who has long been a prominent engineer on the Panama Canal, in reply to the question, "What is the chance for success with farming to one coming to these countries from the United States?" said: "The man who can make a success of farming here will make a greater success in the United States." After a moment of reflection he added, "I am speaking of the man with small capital. If one has sufficient capital and means of obtaining money as it may be needed, there are opportunities in large-scale farm enterprises, such as the growing of bananas on a considerable area, or the production of sugar cane on good sugar cane land. One must know how to distinguish good land from the bad and also how to establish clear title and binding contracts."

This undoubtedly is the correct appraisal of the possibilities. Without capital there can be, usually, little hope for success in the average case, although foreigners with almost nothing have entered these countries and gradually acquired fortunes in growing coffee and other

products. Not only the foreigner but the native will need capital to accomplish much in the undeveloped sections.

In this connection it may be pertinent to quote the opinion of those who have contributed to the Commerce reports of the U. S. Department of Commerce:⁷

Experienced banana growers occasionally quit the large companies and enter the independent field of production with success. Other operators spoke of their intentions to establish banana farms of their own, claiming that with 1,000 hectares of good land, it would be possible to net \$100,000 or more annually after the first crop. But locating 1,000 hectares of good banana land is not so readily done in many localities, since the more accessible regions have been pretty largely looked over for these high grade fruit soils.

Not all of the experienced are optimistic as to future development in Central America. A successful banker and experienced banana grower, an American operating in the capital of Costa Rica, was none too cheerful in his predictions relating to agricultural progress in the general region. He cited the fact that for nearly 400 years Europeans and others have travelled through the fertile San Juan Plain country of Costa Rica from the sea to the highlands without leaving any impress upon the locality—which is still largely virgin jungle as it was when the Spanish completed their conquest in 1530.

⁷ Supplement to Commerce Reports, No. 27, p. 9.

"There are many hazards in the agricultural industry in Costa Rica, as in other Central American countries, and the minimum investment by American or other foreign settlers should not be less than \$10,000, depending upon which particular branch is selected. Most of the large 'finca's,' or landed estates, are in the immediate vicinity of the cities, on account of the poor transportation facilities usually prevalent. Additional land capable of cultivation may be secured, but much of it is at present off the avenues of easy transport. The price of such lands is contingent on locality fertility, and adaptability to various crops, but in Costa Rica if a title is once registered in the office maintained for that purpose, it is fully protected by law.

"The average price of a Central American coffee plantation producing 1,000 quintals (Spanish quintals of 101.43 pounds each) of coffee annually, is given by one of the largest American houses interested in the buying and marketing of coffee as \$35,000 to \$50,000, according to locality. Money costs the planters an average of 10 per cent and most of them borrow to the limit of their credit facilities. Thus on an investment of \$40,000 an initial overhead of not less than \$4,000 on 1,000 quintals, or 4 cents a pound is created. The average cost of raising a pound of coffee, including picking, curing, and cleaning, runs close to 5 cents a pound. To this must be added about 3½ cents a pound for freighting, export duty and transportation to the nearest market—say, San Francisco—which brings the net cost to the planter, without interest on his investment, personal salary, depreciation, etc, around 12½ cents a pound. The house giving these figures further says that the coffee planter is not prosperous unless he averages 16 to 17 cents for his fine varieties, and 14 to 15 cents a pound for his low and medium grades.

"The same general difficulties attend the cultivation of sugar cane, bananas, cacao, or other fruits. Transportation difficulties, labor scarcities, local conditions and customs, and the use of a foreign language are other elements which form important factors in profitable agricultural production in Central America."

Reflecting upon this, one will consider some additional facts. It was only recently that methods of controlling yellow fever and malaria were discovered. These and other diseases formerly took heavy toll of human life in the low countries. The inhabitants of the highlands less than a generation ago looked upon the sickly low sections of their country with such fear that many refused to make trips abroad because of the terrors of the lowlands through which they must pass to reach a ship. Formerly the sites of the present rich banana plantations from Guatemala to Colombia were covered with just as dense jungle as any part of the San Juan Plain. This plain, although consisting of virgin jungle today, will surely be a great banana producing section in the near future.

It is believed the future will bring a very substantial increase in the development of Central America's large agricultural possibilities—increased production of cattle, of cacao, of henequin, and of sugar and bananas in the drier localities where there is deep soil and available water for irrigation. There are possibilities of Para rubber production on abandoned banana fields and in various localities where the virgin forest has never been touched, such as the great depressional region of the San Juan River in Costa Rica. Development of lumbering in the vast forested areas will surely come about and probably be long-lived. But this growth will take place gradually. Construction of highways and rail lines and the opening of the bars that now impede navigation on many of the rivers are positively essential to further important progress. Means of controlling economic wastage and demoralization through revolutionary adventures no doubt will be found, just as ways have been found for subduing the terrors of yellow fever and controlling malaria.

GEOGRAPHIC SECTIONALISM IN AMERICAN HISTORY

FREDERICK JACKSON TURNER

INTRODUCTION.—Sectionalism in American history has been so commonly conceived of by historians as the struggle between North and South over slavery that the much more complicated sectionalism, involving all the various geographic provinces of the United States and the regions within them, and exhibiting itself in economic, political, and cultural fields, has been neglected. But, as it is fundamental to an understanding of America, and of particular interest to the human geographer, I venture to present here some analysis of the subject from the point of view of the historian. As the years go on and the United States becomes a settled nation, regional geography is certain to demand at least the same degree of attention here as in Europe. The United States being practically as large as all of Europe, it must be thought of in continental, and not merely in national terms. Our sections constitute the American analogue of European nations. In their normal relations with each other, economically, politically, and socially, we find startling resemblances to the international processes of European history except for the appeal to arms. But these phenomena have been concealed by the disproportionate attention to federal legislation, to state legislation, and to political parties, without digging beneath the surface.

CONFLICT OF THE POLITICAL MAP AND GEOGRAPHIC REGION.—As soon as we cease to be dominated by the political map, divided into rectangular states, and by the form of the constitution in contrast with the actualities; groups of states and geographic provinces, rather than individual states, press upon the historian's attention. John Taylor of Caroline, Senator from Virginia in the early days of our government, urged state sovereignty as the best means of preventing Congress from becoming an assembly of geographical envoys from the great sections; but in fact there was hardly a case of the serious assertion of state sovereignty except where sectional coöperation gave it force, and there various examples of its collapse as a threat when the section in which the state lay refused concurrence. Before his death, Calhoun, the political philosopher of state sovereignty, learned this lesson by heart. Of course the federal system and the state governments are very real things themselves, and cannot be ignored.

Even in intersectional relations the constitutional structure is influential, in view of the equal representation of states in the Senate and,

in part, in the electoral college and in national party conventions. Inasmuch as this feature of the constitution operates to give certain groups of states a sectional power beyond that to which population or property and income tax payments would entitle them, it has particular significance in the adjustment of balance of power in legislation and in party. Thus the eleven states, large in area, which extend from the western boundary of Michigan across to the Pacific on the northwest, a distance farther than from Paris to Constantinople, have only about fourteen million people, while New York alone has over eleven million, and New York and Pennsylvania together have about twenty and one-half million. Of the taxes levied on personal incomes by the federal government in 1922, New York and Pennsylvania together paid ten times those paid by this Northwestern zone. And yet New York and Pennsylvania have but four members of the Senate, while these eleven states have twenty-two. In view of bills providing for expenditure of revenue in the United States as a whole, and for tax rates, it is obvious that here is a situation certain to create sectional antagonisms. This is emphasized by the difference in interests and in social ideals between the two regions. Owing to the fact that New England frequently acts in conjunction with New York and that the six states of New England have twelve senators, most of them from small states, the sectional disparity is measurably alleviated.

SECTIONALISM IN THE COLONIAL PERIOD.—The larger outlines of the sectional picture may be rapidly drawn. In the Colonial era, in the seventeenth century physiography and the different colonizing peoples, each with distinctive psychological traits, produced the three well known sections, New England, the Middle Region, and the South. Toward the close of that century and especially in the middle of the next, publicists began to speak of the desirability of embodying these sections politically. Indeed, the New England Confederation, and later the "Dominion of New England" illustrate this aspect, though they both had but a brief existence. When the Plan of Union was considered in the Albany Congress of 1754, and again when the Constitutional Convention of 1787 discussed the terms of union, three groups of colonies were seriously considered as factors in a new government or as substitutes for a single government. One of John Jay's ablest papers in the *Federalist* had to do with the dangers that would follow a division into sectional unions, both with regard to foreign interference and in respect to domestic peace. From the first, also, there were subdivisions in these colonial sections, corresponding in considerable measure to the geographic regions of the physiographer, which complicated sectional policy and made the exact boundary between sections

hard to draw. The Middle Region, mixed in its stocks, in its institutions, economic life, religions, just as it was in its geologic provinces, was a bone of contention between the Southern and the Eastern colonies.

SECTIONALISM AND THE ADVANCING FRONTIER.—Toward the end of the first century of colonial life, this aspect of sectionalism became complicated by the frontier advance. First, by the development of a sectionalism of the coastal area as a whole and of the evolving West. There was in the first half of the eighteenth century the occupation of what I have called the Old West. In interior and northern New England, central and western New York, and Pennsylvania, and in the Piedmont region of the South, the contact with the wilderness produced a frontier society, and later a more developed Western type of society which made a sharp contrast with the East. This became a migratory sectionalism of West against East, the rule of the majority against minority rights in their vested interests, and property; innovation against conservatism; debtors against creditors. It went on until not only the frontier *line*, as mapped by Henry Gannett, could no longer be depicted, but until the frontier *phase* of our history drew to its close. From Bacon's Rebellion to the La Follette revolt, there are almost continuous manifestations of the sectional contests of East and West, of the frontier and the older areas.

But second, for many years the three Eastern sections conceived of the West as merely an emanation from themselves, and regarded it as a battle field in the struggle for power between the original sections, the raw material wherewith political and economic and even religious preponderance could be built up. On the other hand, the West, almost from the beginning, wherever it lay at the time, thought of itself as an entity, a substantial and separate section in the Union, and as destined to rule the nation in the future.

Third, this frontier advance was not into uniform space, but into a series of geographic regions which progressively opened to the pioneer. Potentially they were the equivalents of European nations in area, in variety and in resources. One by one these provisions were discovered, conquered, settled, and exploited or developed. Into these regional areas were poured the various colonizing stocks. The settlers and the eastern capitalists transformed the wilderness, but in the very process they were themselves transformed by the conditions with which they dealt. Whether by adjusting to the environment or by the kind of labor and thought involved in modifying it, the process of pioneering created new societies, new sections. New England in central and western New York was not the New England from which the settlers came. The Yankees of the Middle West were not the Yankees of

their old homeland. The South Central Southerner was not the same as the Tidewater Southerner.

And, fourth, as the frontier advance drew to a close, as these provinces were no longer regions to be crossed, or merely to be exploited, but home-sections of permanent settlers, the final stage was reached. These sections and regions, like the older ones, became self-conscious, in politics, in economic life, in literature. Mural paintings in the newer, as in the older, provinces; sectional historical pageantry; the marking of trails; local color fiction and poetry; the circulation of newspapers; the gathering of sectional societies, in all the fields of human activity,—such indications of self-conscious sections revealed a new era. The nation is now in reality rather a federation of sections than a federation of states. In a sense, therefore, there was compressed into the relatively brief time of two or three centuries in America, something very like that process of nation-building which had occupied ages in Europe. Before the geographer and the historian and the allied social scientists lies the opportunity to study these reactions between nature and man, with ample documentation and with much of the process under our very eyes.

SECTIONALISM TODAY.—Today there are clear evidences that these varied sections are attempting to express themselves institutionally and administratively, that American geography is demanding recognition of itself governmentally.

First I may mention less formal revelations of geographic sectionalism. Votes in Congress reveal a steady trend toward blocs or sectional alliances, made up of a discontented wing of the dominant party with the opposite minority party, such as the farmer's bloc, a combination of the West and North Central States, together with the democratic South. This, however, is far from being a new thing, though it has gained a new name.

SECTIONALISM AND PARTY LINES.—Again and again throughout our political history there has been a breakdown of party voting and these alliances between regional groups regardless of party affiliations. Calhoun's whole political career shows a desire to use a sectional balance of power and to combine the West with the South. Van Buren would have an *entente cordial* between the plain republicans of the middle region and the planters of the South led by Virginia. Henry Clay and John Quincy Adams would join the northern zone of the Ohio Valley and the North Atlantic. Benton wished to hold the West to a position where, as its political power increased with the admission of new states and with the growth of population, it should be "bid for," as he said, by the older sections. All of these statesmen

consciously recognized that a struggle was going on between all sections, and that their task as statesmen was to find a formula which should unite a sufficient number of sections to carry out a program by combination of interests.

Presidents had felt obliged to warn their countrymen against the dangers of geographic sectionalism. Read the Farewell Messages of Washington and Jackson, the utterances of Wilson and Harding for illustrations. In the **Whig platform of 1856** appears this plank: "Resolved that the government of the United States was formed by the conjunction in political unity of widespread geographical sections, materially differing not only in climate and products, but in social and domestic institutions; and that any cause that shall permanently array the different sections of the Union in political hostility and organized parties, founded only on geographical distinctions must inevitably prove fatal to a continuance of the national union."

SECTIONAL INTEGRATION TENDENCIES.—But all these historic examples are perhaps less significant of geographic sectionalism than the present day steps toward sectional integration. I may mention the attempts to procure united action of the interior in behalf of the so-called "frustrated seaway" of the Great Lakes-St. Lawrence deep water route to the ocean. "Upon a map of economic divides indicated by geography—the Atlantic Seaboard, the Gulf Territory, and the Pacific slope—there is as it were," runs the argument, "an economic desert of a thousand miles east and west, five hundred miles north and south beyond the radius of logical rail haul to either coast." And now this interior sectional complaint, not without implied threats, has won President Coolidge's assent for the project of the Great Lakes to the Gulf of Mexico Waterway. For my purpose it is not necessary to pass upon the economic profitability of such sectional demands. To New England it has seemed like destruction of its industrial power. To New York the choice of the St. Lawrence waterway looks like placing the Great Lake basin at the mercy of England, unless the route runs by way of the Erie canal. To Chicago, as expressed in one of this section's leading dailies, the refusal of Congress and the government to meet the wishes of that metropolis in such matters as the drainage canal seems to demand that the entire Mississippi Valley "rise in revolt against a tyranny which now threatens its very existence." "Our Middle Western agents," is what this paper calls the section's congressmen.

New England shows quite as vigorous sectional tendencies. The Boston press has long been accustomed to urge the section to act as a unit, and to point out that state lines are really artificial and no real barriers.

More recently the papers have announced what one of the periodicals dubs "A League of New England States"—a New England States commission of seventy-two members, twelve from each state, with an annual conference.

Of course the unity of the Pacific Coast is exhibited whenever the Oriental question arises, as is the solidity of the South when the race question in the form of the negro is raised.

But, going farther, there is in progress a movement of legal integration of geographic sections—a possible equipment of new units for federal government in the form of groups of states. Recently the *Yale Law Journal* (May, 1925) published an article by Professor Felix Frankfurter, of the Harvard Law School, which ably sets forth the legal aspects of the application of the Compact Clause of the Constitution as a phase of interstate adjustments. State compacts have included boundary agreements, state debt agreements, compacts over navigable waters, over drainage and irrigation basins, over criminal jurisdiction, control of floods, fishing, tunnels, etc. More recently there are the Colorado River Compact of 1921 between seven states regarding the equitable apportionment of the waters of the Colorado river; the New York-New Jersey ports agreement of the same year; the Columbia River Compact of 1925; and the proposed Delaware River Compact between Pennsylvania, New Jersey, and New York, in which the disposal of sewage, hydraulic construction, and a supervising administrative agency are involved.

As the plans for coordinating hydro-electric power plants within different sections are formulated, the realization becomes increasingly keen that the states must be tied into groups for effective action in this field which may conceivably become an important instrument in reshaping America's legislative and administrative units. Regional solution of problems by use of the compact clause of the constitution, which permits state agreements by consent of Congress will probably be invoked in the development of what has been called super-power systems and electrical giant power combinations. The problem of interstate arrangement regarding power not long ago engaged the correspondence of Governor Smith of New York on behalf of her water power, and Governor Pinchot of Pennsylvania regarding her coal fields. Secretary Hoover, who was influential in procuring the Colorado Compact, believes that the United States will be divided into several power areas: New England and the Mid Atlantic states, the area from the Mississippi river to the Alleghenies, the South Atlantic, the lower South Central, and the North Central States, each with separate prob-

lems, unsuited to federal legislation, either by the actual conditions or by constitutional limitations.

In these important new power developments state machinery can provide for local regulation, and there can be general federal oversight, but there is needed a new sectional, regional, provision for coördination in groups of states, each presenting distinct problems. For such governmental machinery the way is now preparing through sectional councils like that of New England and sectional agreements such as these under the compact clause, with national consent through Congress. A new governmental organization appears to be evolving, not by theory, but by the pressure of solid geographic realities, and by economic interests, peacefully preparing the way for recognition of the geographic section as an integral part of the national machinery. The regional arrangement of the Federal Reserve Bank; the proposed regional consolidation and administration of the railroad systems; the regional analysis of census statistics, all add to the same conclusion.

Does this indicate a dissolution of the Union? Are we to become another Europe? Are sections to evolve into nations? I do not think so. While we are becoming conscious of our sections, Europe is attempting to bind her nations into a league. We have become aware of the reality of the geographic region in our political, as in our economic and cultural life, and Europe is now becoming aware of the need of bringing within a single political organization the interdependent nations that make up that continent. The Pax Americana is not without its influence upon the war-torn continent of the Old World.

Not only is there this world tendency toward integration, with preservation of autonomy, but the United States has found in practice a bond of union which, as yet, Europe does not possess. Rival political parties, national (that is intersectional) in their scope and following, exist here. As yet Europe has not acquired international political parties, continental in their scope, as they would have to be to correspond with those of the United States.

THE GEOGRAPHY OF PARTY PREPONDERANCE.—In this country there is an interesting geography of party preponderance. Too complicated for statement in brief, in general the situation may be described geographically as regional conflicts within the different sections or larger groups of states, such as the South, or the North Central States. The rough country, the least valuable farm lands, the illiterate counties tend, by and large, to be Democratic, as do the principal immigrant populations of the greater cities. The favored soil regions, the least illiterate areas, the most highly capitalized and industrial districts tend to be anti-Democratic, Federal, Whig, Republican, according to the

area. Where there are important exceptions, as along the foothills and ridges of the Carolina mountains, which have been Whig and Republican often, the explanation is usually traceable to historic factors such as the conflict of the slaveholding Whig coast against the upcountry over legislative apportionment, taxation, internal improvement, and slavery. It was a contest of regions, of economic and social ideals. Physical geography, taken simply, was far from dictating the precise way in which the region acted. The Black Belt in Central Georgia and Alabama, and Eastern Mississippi was strongly Whig, with a small degree of white illiteracy, the abode of wealthy aristocrats. But in the mountain counties of the Carolinas among the illiterate poor whites they found political companions in arms. As a rule there were, and are, within each section as classified in the Census Atlas, divergent sub-divisions, geographic regions, sometimes running to neighboring sections, or finding allies in similar though isolated regions in other sections. These sections usually show political preponderances, (taking the county as the unit), of one or the other party. This is a check upon purely sectional parties, or upon exploitive and ruthless action by the section which controls a major political party. Within each section, moreover, partly due to the regional factor, and partly due to the factors of migration and inherited political faiths, the parties are closely divided. To this the South since the Civil War is an exception, but the northern industrial wedge pushed down along the mines, the mills, the hydro-electric powers of the Alleghanies and their foothills constitutes a menace to Southern solidarity. With these regional varieties, with these close party majorities, there are checks to sectional particularism. Its political power is in a state of unstable equilibrium. It stands in danger of disintegration itself, unless its cause overwhelmingly appeals to its people.

National party then has been in America a flexible bond, yielding in extreme cases to sectional insurgency, yielding often in the construction of bills, to sectional demands, and to sectional threats, but always tending to draw sections together toward national adjustments by compromise and bargain. A common language, law, and institutions, absence of sectional concentration of religions and races, absence of historical hatreds, have helped to prevent America from splitting apart and falling into European conditions; but regional geography, *quasi* continental parties, and a national, that is, intersectional (our equivalent of international), congressional organization by which sectionalism could express itself in voting instead of by war—these are important factors in the contrast between European and American ways of settling difficulties, and are important explanations of our continued unity.

CONCLUSION.—What is now needed is coöperation between the geographers who have come from geologic training to an interest in the regional aspect of human geography, the statisticians who have aimed to divide the nation into convenient sections for census data; the politicians, economists, and bankers who have tried to map the federal reserve districts; the railroad experts, business men in general, the historians, the students of literature and of society to make a more adequate survey of what are actually the natural regions in human geography, as shown by human action. Across the provinces as delimited by the geologists and the physiographers flowed the migration of men from the seaboard sections, the later immigrants, the whole flood of social and industrial developments, changing the obvious influences of physiography a glacial invasion of humanity, as it were, modifying but not obliterating the older landscape. We need a mapping by human geographers that shall take account of these factors, in politics, economics, society, literature, in all the social sciences. Until then sectional delimitation can only be in the nature of a reconnaissance, needing refinement.

THE PHYSIOGRAPHIC INFLUENCE UPON THE DISTRIBUTION OF POPULATION IN MARYLAND AND PENNSYLVANIA*

A. K. LOBECK

INTRODUCTION.—For the past two or three years the author of this paper has been engaged in classifying the minor administrative divisions of the United States (that is, townships, etc.) on the basis of physiographic provinces, in the interest of the National Research Council. The ultimate purpose is to have as many statistics as possible coming from the Census Bureau given by these administrative divisions rather than by counties as at present. Opportunity would then be afforded to correlate more closely the statistics and the physiography and to study the effect of the physiographic setting upon many phases of human interest. At present, population figures alone are available in these smaller units. It is with the purpose of experimenting with a problem of the type suggested that some of these figures for the last two decades in Maryland and Pennsylvania were placed in their physiographic background and the accompanying deductions made.

The conclusion we draw from this type of study is that the value of the study is lessened if the figures for too large an area are grouped for the purpose of coming to some generalization. If, for example, we had taken Pennsylvania and Maryland as one unit instead of two, and had then drawn conclusions regarding the movement of population in each physiographic province included therein, we should have failed to bring out certain distinctions between the two states, as for instance the difference between the Pennsylvania and Maryland piedmont areas, due to the industrial and urban character of the former and the rural character of the latter. We would in consequence recommend studies which dealt with limited areas of rather unified character, with the intent of delimiting or even of discovering such units within the different physiographic provinces. In other words, we feel that the wide range of conditions even within a physiographic province invalidates or at least reduces the value of any generalization which may be arrived at by considering the province as a whole. That is to say, the contrasts within a province are often greater, as far as many statistics

* The author is greatly indebted to Miss Frances Glenn for her classification and analysis of the statistics used in the preparation of this paper. These were originally submitted as a thesis in the Department of Geology and Geography at the University of Wisconsin.

are concerned, than those between the physiographic provinces themselves.

POPULATION STUDIES OF MARYLAND PHYSIOGRAPHIC REGIONS.—Although the population of Maryland in 1920 shows an increase of 12 per cent over 1910, it is below the average increase for the United States during that decade, namely 15 per cent. The more detailed study of the population reveals in a most striking way the changes that have taken place in the physiographic regions. In studying the Coastal Plain the increases in population in the various minor civil divisions range from 2 per cent to 80 per cent in 1920 over 1910, the average being 21 per cent. But of these 33 increases, 16, or a half of them, were in cities and towns, and the increase is correspondingly larger in cities of greater population. The decreases in this area in the same decade range from 2 per cent to 33 per cent, the average being 12 per cent, and that is considerably lower than the average increase per cent.

Population Changes in the Coastal Plain.—A comparison with the figures for the Coastal Plain for 1900 to 1910 brings out the fact that between 1910 and 1920 the war played a part in attracting people to the cities. In the earlier decade the increases in the minor civil divisions of the Coastal Plain of Maryland range from 1 per cent to 72 per cent, with an average of 18.5 per cent. From a study of the increases for 1910 and 1920 over 1900 and 1910 respectively, it appears that the population in the smaller towns and cities helped to furnish the increase in the larger cities, for of the eighteen towns of the Coastal Plain that showed increases in 1910, eleven of them failed to maintain their position in 1920 and eight out of the eighteen actually showed a decrease of from 4 per cent to 10 per cent from their numbers in 1910. That the exodus from the rural districts to the larger cities was not so great seems to be evident when comparing the average decrease from 1900 to 1910 of 11.7 per cent with that from 1910 to 1920 of 12.2 per cent, showing a difference of but 0.5 per cent.

Changes in the Piedmont.—In the Piedmont of Maryland the increases for 1920 range from 3 per cent to 46 per cent, but if the two large increases of 46 per cent (both of which were in large cities) be disregarded for the moment, the range is reduced to one of 3 per cent to 13 per cent. The average increase is 13.3 per cent and the average decrease, 7.8 per cent; but there were twice as many decreases as there were increases, and the decreases range from 4 per cent to 16 per cent, which is not so wide as that of the increases noted above. As was the case in the Coastal Plain, the cities show the larger gains. Of the twelve increases in this area five, or 41 per cent of them were in cities.

As in the Coastal Plain what appears to be the effects of the war were active in the Piedmont also, for of the increases seven of them were rises from decreases ranging from 1 per cent to 23 per cent in 1910; three of them were decided increases over those of the 1900-1910 decade, while four of the 1910 increases became decreases in 1920.

In both the Triassic Lowland and the Blue Ridge regions the paucity of statistics gives an abnormally high average for both the decreases and increases. It is interesting, however, to note that in both regions the number of decreases is three times the number of increases.

In the Appalachian Valley the few cases in the decreases for the 1910-1920 decade and the few for the increases and decreases for the 1900-1910 decade, render these figures inaccurate for comparing this region with the other physiographic areas. However, we may note the decline of 3.6 per cent in the average increases and one of 6.5 per cent in the average decreases of the later decade over the preceding one. This would seem to indicate slightly greater stability in the population of the different administrative subdivisions, during the later decade.

In the Allegheny Plateau, the rapid rise of Kitzmillersville from a small village in 1910 to a city of 2,400 by 1920 creates an abnormal rise in both the range and average for the increase in both decades. With this one exception the decreases in the 1920 and 1910 figures are double the number of increases and the averages of each of the two sets are practically the same.

Allowing for the discrepancies due to relatively few cases, and the abnormal variation of one or two minor subdivisions it is safe to conclude that the Coastal Plain is the most attractive physiographic region of Maryland. That its proximity to the Chesapeake plays no small part in its attractiveness may be safely inferred. The least attractive region, the one with the greatest proportion of decreases, is the Appalachian Plateau, and the most stable is the Piedmont.

POPULATION STUDIES IN PENNSYLVANIA PHYSIOGRAPHIC REGIONS.—Pennsylvania, quite unlike Maryland in many respects, was strikingly so in regard to the variability of its statistics from one decade to another. Not infrequently places that showed increases as high as one hundred twenty-five per cent in the 1900-1910 decade would show decreases of twenty-two per cent or more in the following decade. The fact that a minor subdivision showed a decided increase in one decade did not indicate a probability of its continuing the same in the succeeding one. This greater fluctuation of the Pennsylvania statistics may, in part, be attributed to the greater predominance of the mining

and manufacturing element in the population of that state as compared with Maryland.

In the Allegheny Plateau.—The Allegheny Plateau area shows the largest increase in the last decade, an average of 38 per cent. Since this physiographic region includes a considerable portion of the industrial and agricultural area of Pennsylvania, one would naturally expect to find a relatively high percentage of increase here. In spite of this, however, the actual number of decreases in the minor civil divisions exceeded the number of increases by one hundred fifteen. However, practically one-half (47 per cent) of the decreases for the 1910-1920 decade were smaller than 100, while slightly more than a third of the number of increases were those of a hundred or less. While the number of minor civil divisions showing decreases exceeded the number showing increases, the report shows (in round numbers) an actual gain of 2,446 hundred and but 671 hundred decrease for the past decade, so that, taking the region as a whole, there was a gain of 1,775 hundred people. The attractiveness of the Allegheny Plateau region contrasts with the statistics for this region in Maryland. Although the figures may be too high or too low for the latter on account of few cases, they are rendered the more reliable in Pennsylvania by the fact that here a thousand minor subdivisions were included. The rural districts outnumbered the urban districts two to one in the number of minor civil divisions showing increases in this physiographic area. The high price of agricultural products during the war and the easily accessible ready markets close by acted as an inducement to attract people to the rural districts and the slump in industry following the war was a repellent factor forcing people from the industrial centers. The result of these two forces perhaps accounts for this fact.

Population Changes in the Appalachian Valley.—In the Appalachian Valley the range of increases (1 per cent-310 per cent) is about the same as that in the Allegheny Plateau area (2 per cent-350 per cent), but the average increase was 22 per cent in the former as compared with 38 per cent in the latter. The average decrease was also slightly lower, being 12 1/2 per cent for the former and 20 per cent for the latter. The whole area shows an increase of 1,094 hundred for the last decade. If one considers the size of this area as compared with the Allegheny Plateau area, its gain in actual numbers is greater than that of the Plateau. Considering the area as a unit apart from the rest of Pennsylvania, it appears less favorable, for of the 649 minor civil divisions 380 showed decreases in the last decade, although a little over half of that number were slight ones. Nevertheless, the number of decreases in the last decade showed a very slight gain over the number

in the 1900-1910 decade. In this area the cities barely outnumbered the rural districts in the number of civil divisions showing increases (141 out of 269). The situation then appears to be very much the same as in Maryland.

Population Changes in the Triassic Lowland.—In the Triassic Lowland the average increase of 21 per cent as compared with the average decrease of 10 per cent appears more favorable than the averages for the two areas just discussed, but not so favorable as in the Piedmont or East Lake region. In this physiographic area 57 per cent of the minor civil divisions showed increases while the actual gain for the region was but 361 hundred. One must, however, keep in mind that this area is considerably smaller than the two areas just discussed. When compared with the 1900-1910 decade this area and the Piedmont are seen to be the most stable of the physiographic areas of Pennsylvania when considered from the average per cent of increase and decrease for each decade as well as the number of minor civil divisions showing increases and decreases in each decade. In the Triassic Lowland as in the Appalachian Valley the cities only slightly outnumbered the rural districts in the number of minor civil divisions showing increases (58 cities out of a total of 110 increases). The stability of these two physiographic regions is, no doubt, due to the fact that they are not so highly industrialized as the other sections, and, consequently, are not affected by the variations accompanying industry.

In the Pennsylvania Piedmont.—The average increase in the Pennsylvania Piedmont (38 per cent) exceeds that of the Maryland Piedmont (13.3 per cent). One might quite naturally infer that the Pennsylvania Piedmont area is more inherently attractive than the Maryland Piedmont. However, it is likely that the attractiveness of the Coastal Plain of Maryland and the advantages of the Chesapeake have a tendency to draw people away from the Maryland Piedmont to the coast. In the Pennsylvania area the navigable sections of the Susquehanna and the Delaware rivers lie in the Piedmont area. Before the time of railroads the population centered in these sections for commercial reasons. Their early start has given them the advantage even today. Their proximity to the coal area and the facilities for securing the raw materials both by rail and by water have made the Pennsylvania Piedmont increase more rapidly than the similar area in Maryland. Owing to the present excellent facilities for transportation, the advantage of an early start in manufacturing, and the attractiveness of the city, Philadelphia continues to draw large numbers to this region. The fact that it is the fourth commercial city of import-

ance in the United States and the third in industry is primarily due to its good harbor and its important hinterland.

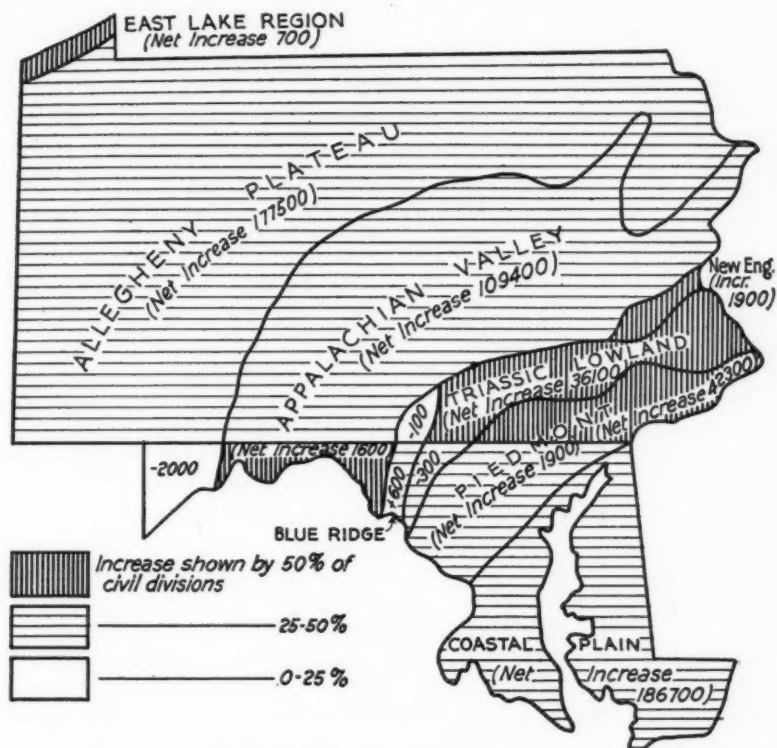


Fig. 1. Increase in Population of the Physiographic Regions of Pennsylvania and Maryland.

When considered apart from the rest of Pennsylvania, the Piedmont's average increase for the 1910-1920 decade is one per cent lower than that of the previous decade, but its average decrease is also lower. In actual numbers the total increase dropped twenty hundred in the past decade although the number of minor civil divisions were equally divided into increases and decreases. Although the Piedmont of Maryland gained nineteen hundred in actual numbers, sixty-nine per cent of the minor civil divisions showed minus returns.

In the New England Upland.—In the New England Upland area of Pennsylvania the statistics are so meagre that one can safely draw

but few conclusions. As in the Piedmont there are as many minor civil divisions showing decreases as there are increases but the average per cent of increase (17 per cent) is higher than the per cent of decrease (9 1/2 per cent). In actual numbers the increase in this area is nineteen hundred, a considerable gain when one considers the size of the area. Besides, its total increase for the 1910-1920 decade is practically double that of the preceding decade. Situated between the

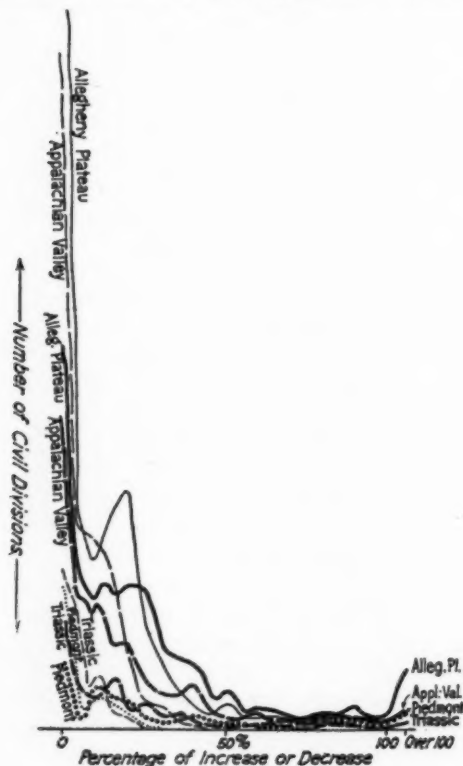


Fig. 2. Graph Showing Distribution of the Increases and Decreases of Population in Several of the Physiographic Provinces of Pennsylvania, between 1910 and 1920.

The increases are shown by heavy lines, the decreases by light lines.

This graph shows that in each of the four provinces represented, the number of civil divisions having small decreases far exceeded the number having small increases; that in none of the provinces did any civil divisions show large decreases, of 100 percent. or more; that in only one province, the Allegheny Plateau, did any of the civil divisions show decreases of 50 per cent. or more; and that in all cases the number showing small increases or decreases far exceeded those showing large changes.

densely populated areas tributary to New York and tributary to Philadelphia, it is in a position to receive the overflow from these areas. Its increase can not be attributed primarily to its agriculture or its manufacturing, for although both play a part in tipping the balance in favor of the region, it is not suitable for agriculture as the Piedmont or the Allegheny Plateau nor highly industrialized as they and the Appalachian Valley. As regards the actual increase, the cities of this section received two-thirds of the total increase for the section as a whole. The fact, too, that the limits of the civil divisions do not coincide strictly with the boundaries of the physiographic province, but run out into the adjacent areas, should not be overlooked.

In the East Lake Section.—The East Lake section of the Central Lowland of the Interior Plains is so small a section that but little can be deduced with safety from the available figures. However, every gain was an urban one. Both gains and decreases were very slight and about equal in number although the increase for the area was seven hundred.

SUMMARY.—In the Coastal Plain, Piedmont, Triassic Lowland, and Blue Ridge, of Maryland, the number of administrative subdivisions in each case which showed decreases was between two and three times the number showing increases, indicating more or less a uniform tendency throughout eastern Maryland toward a thinning of the population over wide areas and a corresponding concentration in fewer and in general smaller spots. This is in contrast with the Piedmont and Triassic sections of Pennsylvania where over half the civil divisions showed increases, due to the more urban character of the Pennsylvania region, with the result that the city movement was more pronounced.

In the Appalachian Valley, while only about one-third of the civil divisions registered an increase in population, this was about equally divided between rural and urban regions.

In the Allegheny Plateau of Pennsylvania we find little effect of the city movement for, although only one-third of the civil divisions increased in population, there were twice as many rural divisions showing increase as there were cities or towns.

OBJECTIVES IN A GEOGRAPHIC FIELD STUDY OF A COMMUNITY

D. H. DAVIS

DEFINING THE FIELD OF GEOGRAPHY.—Both American and European geographers have given much consideration to the delimitation of a definite field of geographic inquiry and the formulation of a systematic method of attacking geographic problems. In this country, various presidential addresses before the Association of American Geographers have presented viewpoints which represent the trend of geographic thought in the United States.¹ More recently, C. O. Sauer, after re-examining the field and taking into consideration current views abroad as well as in this country, concludes that "modern geography is the modern expression of the most ancient geography," and that the "readjustment which is involved in our return to our permanent task is responsible for the current activity of inquiry as to the content of our field."²

From these inquiries, a rather definite concept of the nature of the subject has evolved, so that although divergent views still exist as to the character of the treatment which should be accorded to the material within the undebated portion of the field, geographers in general agree that only facts of "habitat significance" lie within the province of a geographic study.

THE CHANGING VIEWPOINT.—For many years geography in this country labored under the handicap of generalizations based upon superficial observations, with few or no quantitative studies. The gathering of exact data and the establishment of correlations based thereon were replaced by the advancement of hypotheses and the interpretation of phenomena in terms of the preconceived causation.

Recently American geographers have more fully appreciated the necessity for placing geographic studies upon a quantitative basis. As a result, considerable attention has been focussed upon the technique of gathering and recording facts of habitat significance. The recent

¹ Davis, W. M.

An Inductive Study of the Content of Geography: Bull. Am. Geog. Soc., Vol. XXXVIII, pp. 67-84, 1906.

Fenneman, N. M.

The Circumference of Geography: Ann. Assoc. Am. Geog., Vol. IX, pp. 3-12, 1919.

Barrows, Harlan H.

Geography as Human Ecology: Ann. Assoc. Am. Geog., Vol. XIII, pp. 1-14, 1923.

² Sauer, Carl O.

The Morphology of Landscape: Univ. of Cal. Pub. in Geog., Vol. II, No. 2, pp. 19-53, 1925.

contribution in this direction, made by W. D. Jones and V. C. Finch,³ embodies the results of geographic field conferences of three years standing and represents a point of view which is obtaining general acceptance in this country. An illustration of this method of attack, as applied in an agricultural community, is presented by W. D. Whittlesey in "Field Maps for the Geography of an Agricultural Area."⁴

AIMS IN COMPARISON WITH OTHER SCIENCES.—A definite method of assembling and recording facts is a necessity. The chemist and the physicist have balances and other instruments of precision by means of which measurements, within certain predetermined limits of error, can be made. Similarly, the geographer must evolve a system of recording essential data accurately if geography is to be entitled to rank as a science.

After a fair degree of technique has been attained, however, the assembly of geographic facts is and should be largely mechanical. The assembly of such facts is necessary if satisfactory correlations are to be established, but despite the contention in certain quarters, that for the present at least, our major objective should be the accumulation of such data, it is very doubtful whether the establishment of this type of goal of achievement for American geographers would result in appreciable progress.

In other fields of science, the worker establishes an objective and then accumulates facts which have or appear to have some bearing on the problem which it is desired to solve. Similarly the geographer should first decide the aim of his study and then marshal only such facts as are pertinent, considering the end in view. The delimitation of the entire field of geographic inquiry does not define the facts necessary for attacking a definite project any more than the definition of the field of chemistry or physics determines the exact facts which will be assembled by the individual in an attempt to solve a given problem. In geographic studies, as well as those in other fields of science, the class of data dealt with is indicated by the limits of the subject, but only the objectives of a given study will determine with finality the facts to be sought and the method of assembly. In view of this situation, the definite objectives of the different possible types of geographic studies, as well as the direction and extent of the initial studies, have received far less than their merited consideration.

³ Jones, W. D. and Finch, V. C.

Detailed Field Mapping in the Study of the Economic Geography of an Agricultural Area: *Ann. Assoc. Am. Geog.*, Vol. XV, pp. 148-157, 1925.

⁴ Whittlesey, D. W.

Field maps for the Geography of an Agricultural Area: *Ann. Assoc. Am. Geog.* Vol. XV, pp. 187-191 and 2 maps, 1925.

STUDIES OF PROBLEMS OF URBAN GROWTH.—Within recent years, increasing machine utilization in the extractive and other industries, together with improved methods of transportation, have located all business functions except the extractive and transportation functions, at points favorable for the concentration of raw materials and power. At points most favored, where the greatest number and most valuable resources can be assembled with the lowest transportation costs, our great cities have developed; at less favored locations, smaller urban centers have appeared. These urban aggregations are not parasitic in character; they supply the demand for necessary consumption goods; to produce such goods elsewhere would involve an economic waste.⁵

In the more or less haphazard growth of such cities, however, certain problems have arisen, and in many of these urban centers at least, the maximum opportunities of the concentration point are only partially known and realized; in other cases, it is probable that optimum conditions do not exist for the development of certain types of industry already located. The theoretical pattern of distribution of industry departs from the actual for many reasons, some rational, some non-rational. In order to eliminate wasteful procedure and to achieve desirable social ends, the need for careful, scientific community studies has of late been recognized in increasing degree. Such studies have been made or are in progress, either as complete or partial surveys, for New York, Chicago, Cincinnati, and St. Louis, and others are being planned. In most of these surveys, however, the geographer has participated in only a minor capacity, although the nature of his subject is such that he should have a prominent part in such studies.

A PROPOSED COMMUNITY STUDY.—A community study is, therefore, proposed as a type of geographic field study which can be attacked advantageously at the present time and what appears to be a feasible type of community for the prosecution of the initial studies will be suggested, together with certain objectives for such studies.

In view of our concept of the field of geographic inquiry any complete community study must embrace both rural and urban areas in consequence of the interrelationships which exist between an urban center and its "trade territory." To be of maximum effectiveness, such surveys cannot consist in major part of a perfunctory verification of facts of common knowledge. This is practically unavoidable if an area embracing a large urban center is selected, as quantitative studies of value cannot be made of such areas without extensive coöperation

⁵ Haig, Robert M.; Some Speculations Regarding the Economic Basis for Urban Concentration: *Quarterly Jour. Economics*, pp. 186-187, Feb. 1926.

and backing which the geographer will be unable to secure until he has proven the definite value of geographic studies to the community.

In a community study of an area embracing a major urban center, the size of the urban component and the tributary area or "trade territory" which must be considered, if a complete geographic analysis of the community is to be made, is so large and the problem is so complex that the physical limitations of the task make it impossible of solution without coöperation. This coöperation, the geographer at present finds it impossible to secure. The sources from which the desired information could be secured are closed, partially because of non-appreciation of the practical value of such studies, in part because the collection and tabulation of the available data involve an expense which is not felt to be warranted. Often a disinclination to impart information may be traced to fear that the facts would benefit competitors if disclosed, consequently, if information is supplied, it is so general in character that the quantitative basis for the study is destroyed. Even in case no fear of disclosure of data is present, it frequently occurs that the information sought is not in existence in the form desired and the amount of expense involved in securing it is so great that it is difficult or impossible to enlist the aid of those in possession of the sources of information.

The difficulties enumerated are all real; they are difficulties which are faced regularly by every civic and commercial association attempting to acquire information from its members and they confront the geographer who works alone to an even greater extent. For this reason, our efforts should for the present be confined to studies of small communities without complex relationships.

The Size of the Area.—For the initial geographic field studies of communities, the areas chosen should be small, probably not to exceed 200 square miles in extent, and the urban component should also be of small size and free from industrial development not based directly, at least in major part, upon the resources of the immediate area. The urban component need not necessarily be an urban center by census definition, as the actual size of the town or village is immaterial for the initial studies, which are, from the standpoint of the geographer, primarily for the purpose of demonstrating the value of methods and result.

Physical Characteristics of the Area.—The initial studies should preferably be carried on in areas of diverse soil types, topography, and original vegetation cover. A region which has been occupied a relatively short time is preferable to an old settled community, as it is easier to trace the developmental history and there is less

persistence of activities without adequate explanation in the present conditions in the area. If diversity of racial groups can also be secured, it will be an advantage. Such a community as described possesses great diversity, yet does not present a complex problem incapable of solution, as the size of the area involved is not great; it is self contained to the maximum as a result of the absence of extensive industrial development; and the recency of the original occupation precludes the existence of many activities with inherited bases.⁶

Major Objectives in a Study.—It is not proposed to discuss either the technique of gathering and recording data or to detail all possible objectives for a geographic field study of a community, but to confine the consideration to some of the major objectives which will apply in any community study and which must be formulated before the gathering of data is begun, as an aid in determining the class or classes of facts which should be assembled. For any given community, a hasty preliminary survey of general conditions within the area should be valuable in the formulation of definite and more detailed objectives for the particular study to be undertaken.

1. The first of these major objectives is the delimitation of the area or the determination of the extent and the exact boundaries of the "trade territory" of the urban component of the community. In general pattern, this will doubtless be roughly circular in outline, but in detail it will present many irregularities which must be determined with accuracy. For the smaller communities, these irregularities may result from a variety of factors, among which may be mentioned location and character of the roads, personal preferences of individual farmers which may result from racial solidarity, the character of the products marketed from a given farm, and the means of transportation possessed by individual farmers. This delimitation of the community is of fundamental importance in the formulation of any intelligent

⁶ A geographic field study of the type of community described as suitable for the initial studies is in progress at present in an area of approximately 150 square miles centered around the village of Princeton, Minnesota.

The village, which has a population of 1685, is, for practical purposes, of commercial significance only, manufactures being limited to lumber and brick from local timber and clays.

Soils in the area vary from light sands to heavy lacustrine clays and the topography ranges from a plain of very slight relief to distinctly hilly in character.

The character of the original forest cover was also varied. In part, it was jack pine and scrub oak; in other portions, it was mixed hardwood with occasional white pines.

Within the area there are three distinct racial groups: Dutch, German, and Scandinavian (Norwegians and Swedes), living in compact settlements, in addition to a fourth area of mixed population of all the racial elements named plus English, Irish, and old American stock.

The community being studied thus satisfies all the requirements postulated for the ideal type of community for the initial geographic field studies of communities.

plans for future development, irrespective of the size of the community under consideration. Further, it is normally impossible to establish the limits by inquiry from any single individual or any one group; the only method of securing this information is by means of careful field work. In addition to locating the boundary, the peripheral or neutral zone should be studied quantitatively and the basis for the changes in community affiliation within this marginal zone should be determined.

2. The second major objective is the establishment of quantitative relationships between the urban and rural elements of the community, using the term urban loosely in case the urban component of the community is of small size. Among such relationships which should be determined are:

1. The percentage of the trade of the area which originates in the rural district and that which comes from the urban center.
2. The relative importance of the trade of the areas of different soil types and topography.
3. The actual and relative importance of the trade of the various racial groups in case such groups exist.
4. The percentage of the trade of the community controlled within the community, together with the sources of competition for the trade of the community and the amount controlled by each competitor.

It is necessary to study the relationships of phenomena within the community, otherwise the data are incoherent and the work is of descriptive character only, as in the case of much of the older geography. Further, in case the relationships are not placed on a quantitative basis, the value of the contribution to the community from the standpoint of improvement of economic and social conditions within the area is reduced to the vanishing point.

3. The third major objective is the interpretation of the "anomalies" of the facts of habitat significance, including those of the interrelationships of the various elements of the community, urban, rural, and racial. By "anomalies" is meant the departure from optimum conditions in view of the regional opportunities and handicaps. These interpretations as well as all others in such a community study as is here proposed should be based upon quantitative data which should include complete statistical information as to:

1. Soils and subsoils, determined by actual sampling and testing.
2. Degree of relief.
3. Drainage conditions.
4. Size of farms.
5. Percentage of land improved.
6. Percentage of land in tilled crops, pasture, woodland, etc.
7. Kinds and varieties of crops grown with acreage of each.
8. Total and per acre yield of crops grown to include:
 - (a) Individual variations in yield under the same soil and topographic conditions.
 - (b) Variations in yield in communities of different racial stock.

- (c) Variations in yield with differences in farm size.
 - (d) Variations in yield with change in the percentage of land in crops in farms of similar soils, topography, and size.
 - (e) Effect of different rotations on crop yields under the same and different soil and topographic conditions.
9. Character and amount of the purchases of the different types and other data of similar character.

In many cases, the facts which should be gathered are not the exclusive property of geography, but if they are facts of habitat significance, they are geographic facts. Whether such facts are of significance in a geographic field study of a community is determined by their utility and their utilization.

4. The fourth and most important of the major objectives of a geographic field study of a community, inasmuch as it furnishes the major justification for carrying on such studies aside from the intellectual stimulus which results from the orderly marshalling of facts and the establishment of correlations based thereon, is the formulation of a program for the improvement of conditions within the area studied. The final contribution of a geographic field study must consist of facts which are correlations or conclusions, and to be valid, such correlations must be established on a quantitative basis, otherwise geographic field studies only masquerade as scientific contributions.

In practice, it is probably advisable to investigate conditions in the rural element of the community first. As data accumulate on which valid conclusions can be based, these findings, backed by facts and figures, can be presented to the village or town in order to secure the coöperation which it will be necessary to enlist in order to obtain the information desired from the business interests within the corporate limits.

STUDY, UTILITARIAN AND QUANTITATIVE.—With all the data in hand, it should be possible to establish clearly and on a quantitative basis the interrelationships which exist between the urban and rural sections and to make specific recommendations, backed by facts, looking toward the betterment of present conditions, in both the urban and rural districts of the community, and to outline plans for the advantageous future development of the area.

Throughout, the problems of the community should be attacked on a quantitative basis and the endeavor should be made to secure results which can be utilized in formulating a program for the betterment of present conditions and for the future development of the community as the major objective of the study.

When geographers have demonstrated a method of procedure by such studies of small communities, and when such studies have been effective in promoting improved conditions in such smaller areas,

then it will be possible to attack the complex problems presented by larger areas embracing major urban centers with some possibility of success. The same general procedure can be followed as with the smaller community and the knowledge and technique gained by experience with the less ambitious project can be utilized to solve successfully the more complex problems of the larger area. For geographers to attempt the more ambitious tasks first is to invite failure and to actually slow up progress in the field of geography.

SUMMARY

In summary, I am suggesting for consideration and discussion:

1. A type of unit area for geographic studies, the community, in which unity is afforded by common economic interest.
2. The type of community which is best adapted to our initial studies, in view of our limited experience in this field.
3. The necessity for the formulation of definite objectives for such studies in order to determine the classes of data to be collected.
4. The necessity for a quantitative basis for conclusions so that our conclusions may be accepted as facts upon which others may act.
5. The principal and most important object of a geographic field study of a community is to serve the community.

This is a presentation of a hypothesis as to a desirable type of study for geographers to undertake rather than an attempt to demonstrate the soundness of the view presented. Only an actual field study, such as is now being undertaken, will prove or disprove the soundness of the contentions advanced. With the data now available, such a demonstration is impossible. The hypothesis represents at present only a method of attacking a problem, the solution of which is highly important. It is the hope of the writer that faults, errors, and omissions which may be present will be corrected as it is highly important that progress be made along the lines suggested.

SOIL MAPPING IN GEOGRAPHIC FIELD STUDIES

KENNETH C. McMURRY

This paper presents the results of an experiment in the detailed mapping of a small area. The following maps were made in the field: (1) Soil Types, (2) Land Utilization, (3) Surface, "or lay of the land." In addition a map of assessed valuation of land was prepared from data derived from tax rolls. The discussion both as to method and results is centered on the soil mapping. The other data are correlated with the soil types, for it is felt that the soil is evaluated in a less satisfactory manner in the average field work than are the other geographic forms.



Figure 1

THE SOIL MAP.—The area mapped is a township in the Interlobate Area of southern Michigan. In it till plain, moraine, outwash, and an old glacial outlet are well represented. With the principal land forms of the larger area present in typical form, it was anticipated that the major soil types of the region in general would be represented. Incidentally, the clear cut character of the physiographic forms should make possible the correlation of soil types with geologic boundaries.

fication was more desirable than great detail. The important characteristics of the profile that were studied in the field are as follows:¹

1. The number of horizons in the soil profile.
2. The color of the horizons, with special emphasis on the surface one or two.
3. The texture of the horizons.
4. The structure of the horizons.
5. The relative arrangement of the horizons.
6. The chemical composition of the horizons.
7. The thickness of the horizons.
8. The geology of the soil material. (Largely of suggestive value.)

Field Work.—All these criteria may be recognized in the field without laboratory determinations. A small spade, a soil auger, and a can of "Soiltex" are the necessary equipment. The description of the Miami Silt Loam which follows involves all the criteria mentioned

LAND USE MAP

Cultivated ☐ Pasture ☐ Woods-oak-hickory ☐ elm-maple ☐ tamarack ☐



Figure 3

above. With such a definite description it should be possible to recognize this particular type anywhere.

Miami Silt Loam.—The description is taken at a point where the land has been cultivated, and the humus soil has become intimately mixed with the layer below. Under forest conditions the upper inch or two is forest mold, and is underlain by a brownish gray silty loam containing little humus, which grades into the horizon next described. The next horizon, extending from a depth of eight inches to some fif-

¹ Marbut, C. F. "The Contribution of Soil Surveys to Soil Science," Soc. for the Promotion of Ag. Science, Proc. of the 41st Meeting, pp. 116-142.

teen to twenty-one inches, is a yellow loam to silty loam, mottled with gray, and moderately friable in structure. It is slightly acid. Below this horizon and reaching to a depth of from 27 to 36 inches is a brownish yellow layer of fine sandy or silty clay, compact in structure. It also is slightly acid. The next horizon is a sandy and slightly gravelly till clay, yellowish gray in color, more friable and mealy than the layer above. This extends down to the unweathered till clay at varying depth. It is alkaline in reaction. The surface on this soil type is generally smooth to gently rolling. Surface and internal drainage are fair to good.

These characteristics are illustrated in the profile diagrams.

Recognizing the Soil Types.—The recognition of the soil type by the use of the profile may seem to complicate rather than simplify procedure. Of course the utility of any soil is not measured merely by the characteristics of the plow layer, but is based upon the conditions to the entire depth of the soil. This important fact is included by use of the profile. Thus two soils which have the same plow layer are distinguished if the lower horizons differ. The results are much more accurate than when merely the surface soil is appraised.

A different arrangement or character of horizons at once distinguishes one type from another. Reference to exposures along a stream, or a road or railroad cut, or the use of the soil auger, in most cases determines the type present. In about ninety per cent of the township which was mapped there was little question as to the type occurring at any point. Also there was very little area which failed to come within the types specified. A certain amount of generalization is necessary in drawing boundaries, but on the whole the per cent of error is low, and the results are sufficiently accurate to satisfy the use to which they are put. Under this method of mapping one is certain that within a given soil type the conditions are reasonably constant, and this form of the landscape is evaluated accurately. The results may be summarized as follows:

1. The soil profile gives a definite and dependable basis for the recognition of a soil type, and on the whole such recognition is easy.
2. The actual work of mapping is simple and reliable, and can be carried out in conjunction with the mapping of other forms without excessive increase in labor.
3. A small amount of help from soil experts is sufficient to establish the types in a given area, after which the work may be carried on in a satisfactory manner independently. It seems probable that in most parts of the United States the necessary assistance may be secured without great difficulty.
4. Where assistance is not available it seems likely that descriptions of profiles can be made with sufficient clarity so that they may be referred to authorities for names and correlations.

Value of Soil Mapping.—Although it may be conceded that work of this nature can be carried on without overgreat difficulty, there may be question as to its value in the geographic study of a small area. No one will suggest that the soil as a form of the landscape should be ignored entirely, but there may be question as to whether the results of detailed mapping of soil types justify the effort involved.

CORRELATIONS.—In this study an effort has been made to correlate each of the soil types which occupies considerable area with (1) land utilization, (2) surface, (3) assessed valuation of land. If it appears that utilization, surface, and assessed valuation differ distinctly as between soil types and correlate within each type, it may be assumed that the soil type is the significant factor in effecting differentiation and correlation. It is true as Dr. Marbut points out that the precise significance of the soil factor never has been isolated, and probably it cannot be isolated. The area mapped is not sufficiently large so

SURFACE MAP

Average Slope 0° to 2° □ 2° to 7° ■ 7° to 13° ■ 13° to 20° ■ 20° ■

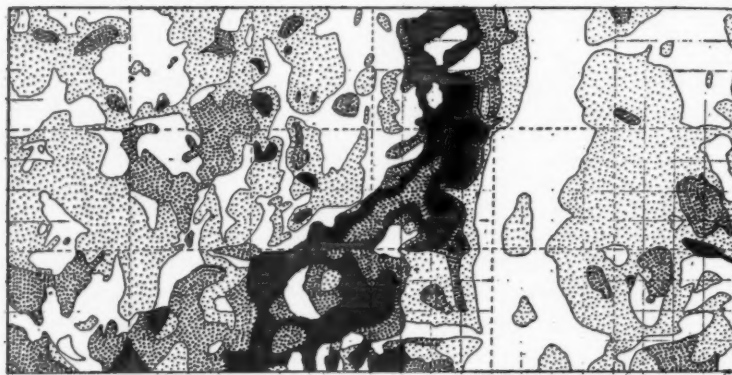


Figure 4

that definite determinations of the significance of surface or drainage can be made. However, the soil profile is both an expression and a result of surface and drainage conditions, and can be taken as a summary of these forms in relation to utilization and land value.

The following table summarizes the relationships which have been computed. Six sections were divided into forty-acre plats, and on each plat the soil types were planimetered and the facts of utilization, surface character, and assessed valuation were related to the type. Thus the relationships are exact in so far as the mapping was perfect.

TABLE OF CORRELATIONS

	Miami silt loam	Leslie loam	Coloma sand	Brookston- Newton	Kalamazoo muck	Pinckney- Ingham mucks
Per cent of total area.....	26.7	23.6	12.5	12.0	10.6	8.0
Per cent in crop land.....	80.8	78.0	39.0	22.0	54.0	2.5
Per cent in permanent pasture....	8.0	11.0	53.0	67.0	32.0	30.5
Per cent in woodland.....	11.0	11.0	8.0	11.0	14.0	67.0
Surface divisions, in per cent of total.....	No. 1-33%	No. 2-52%	No. 3, 4, 5-70%	No. 1-100%	No. 1-100%	No. 1-100%
Assessed valuation per acre.....	2-58 3-9 \$55	3-25 4-23 54	31	34	47	33

The results show great variation in use, surface, and valuation on different soil types. Crop land varies from 2.5 to 80 per cent, permanent pasture from 8 to 67 per cent, and woodland from 8 to 67 per cent. Although the major part of each soil type lies within one surface division, the fact must be noted as very significant that each of the upland types is found on from flat to very rough topography. This means a distinct crossing of physiographic forms. Assessed valuations vary from 31 to 55 dollars per acre. The assessed valuation is merely an approximation, for while valuation is very close to actual selling value in this region, there are few cases where a body of land of a

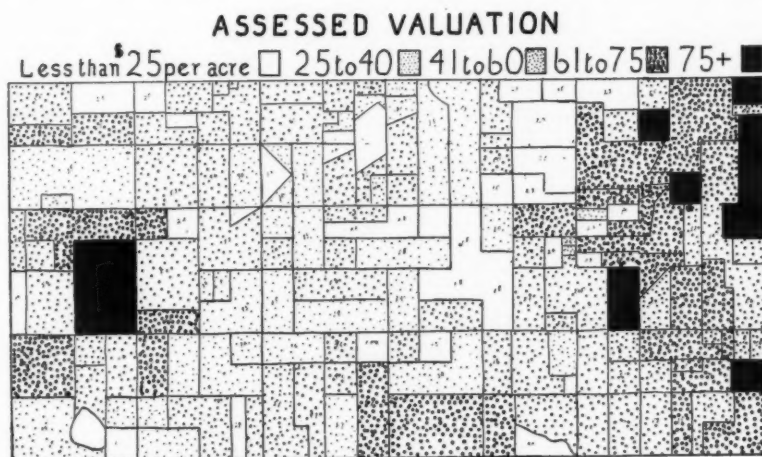


Figure 5

single soil type is assessed as such. Other factors also are taken into consideration in making assessments. Actual valuations of parcels of land vary between 15 and 125 dollars per acre, and certainly the soil types have at least this difference in relative value. The relationship, on the whole, is of large suggestive value.

CONCLUSIONS.—Quantitative relationships of this kind seem to be of sufficient value to justify the mapping of soils in this manner. It is not suggested that this is the only, or necessarily the best method. There are several other correlations which should be made in relation to soil types. Some of these are the details of crop practice, character of improvements, economic history of land use, animal units supported, and seasonal relationships of use. Doubtless there are others. It is felt, however, that the experiment has proved of value in that it has shown that valuable quantitative relationships can be proved in a field in which much of our geographic field study has been very weak.

